



## King's Research Portal

DOI:

[10.1080/13854046.2015.1084377](https://doi.org/10.1080/13854046.2015.1084377)

*Document Version*

Peer reviewed version

[Link to publication record in King's Research Portal](#)

*Citation for published version (APA):*

Renson, Y. C. M., Oosterman, J. M., van Damme, J. E., Griekspoor, S. I. A., Wester, A. J., Kopelman, M. D., & Kessels, R. P. C. (2015). Assessment of Confabulation in Patients with Alcohol-Related Cognitive Disorders: The Nijmegen–Venray Confabulation List (NVCL-20). *The Clinical Neuropsychologist*, 29, 804-823. <https://doi.org/10.1080/13854046.2015.1084377>

### **Citing this paper**

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

### **General rights**

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

### **Take down policy**

If you believe that this document breaches copyright please contact [librarypure@kcl.ac.uk](mailto:librarypure@kcl.ac.uk) providing details, and we will remove access to the work immediately and investigate your claim.

**Assessment of Confabulation in Patients with Alcohol-Related Cognitive Disorders: The Nijmegen-Venray Confabulation List (NVCL-20)**

Yvonne C.M. Rensen<sup>a</sup>, Joukje M. Oosterman<sup>a</sup>, Jessica E. van Damme<sup>a</sup>, Sonja I. A. Griekspoor<sup>a</sup>, Arie J. Wester<sup>b</sup>, Michael D. Kopelman<sup>c</sup>, and Roy P.C. Kessels<sup>a,b,d</sup>

<sup>a</sup> *Radboud University Nijmegen, Donders Institute for Brain, Cognition, and Behaviour, Nijmegen, The Netherlands*

<sup>b</sup> *Korsakoff Clinic, Vincent van Gogh Institute, Centre of Excellence for Korsakoff and Alcohol-Related Cognitive Disorders, Venray, The Netherlands.*

<sup>c</sup> *King's College London, Department of Psychological Medicine, Institute of Psychiatry, Psychology and Neuroscience London, United Kingdom.*

<sup>d</sup> *Radboud University Medical Center, Department of Medical Psychology, Nijmegen, the Netherlands*

Number of words - abstract: 202

Number of words – article (exc. Figures/tables): 4856

Correspondence to: R.P.C. Kessels, PhD, Radboud University Nijmegen, Donders Institute for Brain, Cognition, and Behaviour Centre for Cognition. PO Box 9104 6500 HE Nijmegen, The Netherlands. E-mail address: r.kessels@donders.ru.nl

## **Assessment of Confabulation in Patients with Alcohol-Related Cognitive Disorders: The Nijmegen-Venray Confabulation List (NVCL-20)**

Objective: Even though the first awareness of confabulations is often based on observations, only questionnaires and structured interviews quantifying provoked confabulations are available. So far, no tools have been developed to measure spontaneous confabulation. This study describes and validate an observation scale for quantifying confabulations, including spontaneous confabulations, in clinical practice. Method: An observation scale consisting of 20 items was developed, the Nijmegen-Venray Confabulation List-20 (NVCL-20). This scale covers spontaneous confabulation, provoked confabulation, and memory and orientation. Professional caregivers completed the NVCL-20 for 28 Korsakoff (KS) patients and 24 cognitively impaired chronic alcoholics (ALC). Their ratings were related to the Dalla Barba Confabulation Battery (DBCB), Provoked Confabulation Test (PCT), and standard neuropsychological tests. Results: The categories of the NVCL-20 have ‘good’ to ‘excellent’ internal consistency and inter-rater agreement. The KS confabulated more (spontaneously and provoked), and more problems in memory and orientation were observed. Correlations with neurological test scores showed that confabulations were associated with memory deficits, but not with intrusions and executive dysfunction on the tests used in this study. Conclusions: The NVCL-20 is the first instrument that includes items addressing spontaneous confabulation. Administration is reliable, valid and feasible in clinical practice, making it an useful addition to existing confabulating measures.

**Keywords:** Spontaneous Confabulation, Provoked Confabulation, Memory and Orientation, Korsakoff, Executive Functioning

Confabulations are statements, incorrect in time and place, which are unintentionally produced (Cooper, Shanks, & Venneri, 2006; Dalla Barba, 1993). They are prominent in some brain disorders, such as Alzheimer's dementia and Korsakoff's syndrome (Cooper *et al.*, 1996; Schnider, 2008; Tallberg & Almkvist, 2001). A distinction has been made between several types of confabulation (Bonhoeffer, 1901; Schnider, 2001). The most widely used distinction was introduced by Kopelman (1987). Here, one central feature is crucial: The evocation of the confabulations, distinguishing between *provoked* and *spontaneous* confabulations. A provoked confabulation is considered to be an incorrect response to a question or situation in which a person feels compelled to say something, for example in an assessment situation. It has been suggested that provoked confabulations may be related to intrusions on memory tests and can also be evoked in healthy participants (Bartlett, 1932; Burgess & Shallice, 1996; Kopelman, 1987; Schnider, von Däniken, & Gutbrod, 1996). Spontaneous confabulations, on the other hand, occur without any obvious trigger (Kessels, Kortrijk, Wester, & Nys, 2008; Kopelman, 1987; Schnider, 2008). The latter have been linked to impaired reality monitoring and impaired source memory (Kessels *et al.*, 2008). Another classification in which four forms of confabulation are distinguished, was introduced by Schnider (2008). In addition to the evocation, he included also other aspects of confabulation. *Simple provoked* confabulations are intrusions in memory tests; *momentary* confabulations are false verbal statements produced in situations inciting a patient to respond; *fantastic* confabulations have no basis in reality; *behaviorally spontaneous* confabulations occur in patients with amnesia and disorientation, and lead these patient to act according to their false ideas.

Several researchers have suggested that spontaneous and provoked confabulations are different expressions of the same disorder, with spontaneous confabulations covering the more severe end of the continuum. However, there is also evidence that these concepts

concern two different forms of confabulation with their own neurocognitive mechanisms, supported by findings showing that different neurological and neuropsychological processes are involved (Dalla Barba, 1993; Dalla Barba, Nedjam, & Dubois, 1999; Moscovitch & Melo, 1997; Schnider, 2001; Schnider *et al.*, 1996). Spontaneous confabulation may be the result of a deficit in reality filtering caused by (orbito-)frontal pathology, while provoked confabulation is more likely a normal response to a faulty memory (Kopelman, 1987; Nahum, Bouzerda-Wahlen, Guggisberg, Ptak, & Schnider, 2012). Executive dysfunctions have also been associated with confabulations. Baddeley and Wilson (1988) for example noted that ‘clouding’ of autobiographical memory only results in confabulation behavior when this is accompanied by dysexecutive problems, such as monitoring deficits. In contrast, Cooper *et al* (2006) did not find correlations between confabulations (as measured with the Provoked Confabulation Test) and executive function tests, such as the Stroop Color-Word Test. And while some studies have demonstrated that spontaneous confabulating patients were more impaired on executive functioning task, such as the Wisconsin Card Sorting Task and Digit Span Backwards (Fischer, Alexander, D’Esposito, & Otto, 1995), there is also evidence that (behaviorally) spontaneous confabulators did not differ from non-confabulating amnesics on frontal/executive measures (Schnider *et al.*, 1996; Schnider & Ptak, 1999).

A clear relationship between confabulation and a closely related phenomenon, intrusions, has also yet to be established. Intrusions can be defined as the unintentional recall of inappropriate responses specifically observed in test situations, for example on word-recall tasks such as the California Verbal Learning Test (CVLT) (Dalla Barba & Wong, 1995). In some studies confabulations are even measured as the number of intrusions on memory tasks (Schnider *et al.*, 1996), even though significant relationships between intrusions on memory tests and measures of confabulation has not been found in a previous study (Kessels *et al.*, 2008).

Instruments that are regularly used to assess confabulations include the Dalla Barba Confabulation Battery (DBCBC; Dalla Barba, 1993) and the Provoked Confabulation Test (PCT; Cooper *et al.*, 1996). These paradigms are mostly used for research purposes, and little is known about the validity of these assessments for predicting specific confabulatory behavior (Schnider, 2008). Moreover, the Confabulation Battery and PCT do not cover some important aspects of (spontaneous) confabulation, such as the content of confabulations or acting upon false ideas. Observations by professional caregivers or relatives may offer a potentially valid addition to the assessment of confabulatory behavior. To date, however, standardized observation scales that also aim to include spontaneous confabulation behavior are not available. The purpose of this study was to develop and validate an observation scale that could be used for quantifying confabulations, including all aspects of spontaneous confabulation, in clinical practice. **This observation scale might be of relevance for diagnostic purposes, as the presence of confabulations is a clinical feature in several neuropsychiatric disorders, such as Korsakoff's syndrome, affecting everyday behavior** (Adams, & Collins, 1971; Borsutzky, Fujiwara, Brand, & Markowitsch, 2008; Victor, Adams, & Collins, 1971). It may also serve as a feasible, standardized way to monitor confabulation over time, as (in particular spontaneous) confabulation behavior is often found to be temporally limited. **The decline of spontaneous confabulation over time is also reported to be accompanied with improvement in other cognitive areas, such as normalization of temporal context confusion** (Schnider, 2008), reflecting cognitive improvement of the patient.

**We administered this instrument in a group of Korsakoff patients and compared their scores with those of an alcoholic control group, that is, individuals with alcohol-related brain damage and cognitive dysfunction (but not Korsakoff's syndrome). Korsakoff's syndrome is an irreversible neurological disorder, resulting from nutritional (thiamine) depletion, in which memory and learning (severe anterograde and retrograde amnesia) are disproportionately**

affected compared to other cognitive functions (Victor *et al.*, 1971). Other neuropsychological deficits associated with this syndrome fall, among others, within the domains of executive functions. The neuropsychological deficits in individuals with alcohol-related brain damage are heterogeneous, however, memory is thought to be most vulnerable to heavy alcohol use (Parsons, & Farr, 1981; Rourke, & Grant, 1999). In addition, approximately 80% of these patients show impairments in executive functions (controlled and effortful processing of novel information, and selective and divided attention) (Bates, Bowden, & Barry, 2002; Giancola, & Moss, 1998). These deficits are, however, mild in comparison with those observed in patients with Korsakoff's syndrome (Zahr, Kaufman, & Harper, 2011). Unlike patients with Korsakoff's syndrome, alcoholic controls are not associated with the tendency to produce confabulations. We therefore expected that the observers would have given higher scores to the Korsakoff group on the observation scale than participants from the alcoholic control group.

We validated our instrument against other instruments which measure confabulations; the DBCB and the PCT. We expected to find strong, positive correlations between the category provoked confabulation of the observations scale and the confabulation measures of the DBCB and the PCT. Moreover, since confabulations are often associated with impairments in memory, the production of intrusions on memory tests, and executive deficits (Baddeley & Wilson, 1988; Dalla Barba & Wong, 1995; Schacter, Norman, & Koutstaal, 1998), we included tests of memory, intrusions and executive function, and expected to find significant, positive correlations with confabulation scores of the observation scale.

## Scale development

### *Item generation (alpha version)*

#### *Literature search and expert panel*

The goal was to develop an observation scale which is easy to complete for people who know the patient well (such as professional caregivers). On the basis of a literature search and expert opinion, nine items were formulated that covered all aspects of spontaneous confabulation, asking about; the frequency of confabulatory behavior, the content and coherency of the confabulations, acting on confabulations, and the precipitants to confabulations. In order to assess other aspects of confabulation, three items about provoked confabulations, and five items about orientation and memory, were also included. Five other items contributed to the total confabulation score only. These items asked about aspects associated with confabulation, such as the persistence of confabulations (*‘Can the patient be corrected when telling these stories?’*) and confusing old recollections with new events (*‘Does the patient recognizes acquaintances correctly?’*). All items were rated on the basis of a 5-point **rating** scale.

#### *Evaluation by professional caregivers*

Professional caregivers evaluated the **alpha version** on clarity and applicability. A few adjustments were made in response to their comments. For example, for some items, the **rating** scale ranging from ‘never’ to ‘(almost) always’ was found unclear, and was therefore changed for more extensive behavioral descriptions to rate confabulatory behavior. **This adjusted alpha version** was further evaluated by caregivers, and no adjustments were needed. Therefore, the alpha version of the confabulation list contained 22 items.

#### *Administration*

**Subsequently, we tested the alpha version in clinical practice. This version was completed for Korsakoff patients and alcoholic controls.** All patients were inpatients of the Centre of Excellence for Korsakoff and Alcohol-Related Cognitive Disorders of Vincent van Gogh Institute for Psychiatry in Venray, the Netherlands. **In the Centre, every patient is**



assigned a “primary responsible caregiver”, who coordinates the care of the patient. Most (but not all) patients are also assigned a “secondary responsible caregiver”, who takes over these tasks in absence of the primary responsible caregiver. Because of their important role in the care and treatment of the patients, we asked the primary responsible caregivers to complete the alpha version for the patients under their care. For the 33 patients who also had a secondary responsible caregiver, we asked these caregivers to complete the alpha version as well.

The caregivers read the instruction (see Appendix), which emphasized the purpose of the instrument, namely to assess spontaneous confabulations. Then the definitions of confabulation were given, and in particular, the definition of spontaneous confabulation. The instruction stressed that spontaneous confabulations are produced without any prompts or questions. Finally, instructions were provided about scoring, for example: ‘Please encircle the answer that is most appropriate for the behavior of the patient at the time of completing the instrument’. The **alpha version** took about 5 to 10 minutes to complete.

### *Participants*

The alpha version was initially completed for 42 participants (24 Korsakoff patients and 18 alcoholic controls). At a later point, additional data was collected (ratings from primary responsible caregivers; 4 Korsakoff patients and 6 alcoholic controls), resulting in a **total sample of 52 patients**. The total Korsakoff group consisted of 28 patients (20 men; *M*age = 55.9 years; range = 35-73 years), all meeting the criteria for DSM-5 Major Neurocognitive Disorder due to Alcohol Abuse (American Psychiatric Association, 2013), supported by examination of the patients’ medical history, neuroimaging findings (excluding other etiologies such as tumors or stroke), as well as neurological, psychiatric, and neuropsychological examinations. Also, the criteria for alcoholic Korsakoff’s syndrome

(Kopelman, 2002) had to be met. This included the presence of disproportionate impairments of memory, relative to deficits in other cognitive domains (Victor, Adams, & Collins, 1971). Moreover, patients were only included when they had a history of Wernicke encephalopathy, alcoholism, and nutritional depletion (notably thiamine deficiency) (Kopelman, 2002).

The second group consisted of 24 control patients (alcoholic control group) (15 men, *Mean* = 54.3 years; range = 38-72 years). They had a history of chronic alcohol abuse, which caused persistent, mild neurocognitive impairments. The temporal course of the impairments was consistent with the timing of alcohol use and abstinence (American Psychiatric Association, 2013). The impairments were not attributable to another medical condition, and they did not meet the criteria for Korsakoff's syndrome. All fulfilled the DSM-5 criteria for Mild Neurocognitive Disorder due to Alcohol Abuse. Patients' family and medical records provided background information (including drinking history). All participants were abstinent from alcohol at the time of testing. **The clinical diagnoses were made independent of the current study, by a multidisciplinary expert team of the Centre of Excellence for Korsakoff and Alcohol-Related Cognitive Disorders..**

Level of education was measured within the Dutch educational system using a 7-point rating scale, ranging from 1 is (*less than primary education*) to 7 (*university degree*). The Korsakoff group had a median score of 4 (range = 5). The control patients also had a median of 4 (range = 3).

An estimation of premorbid verbal intelligence was obtained with the Dutch version of the National Adult Reading Task (NART; Schmand, Bakker, Saan, & Louman, 1991). The full scale intelligence quotient (FSIQ) of the Wechsler Adult Intelligence Test – Third Edition (WAIS-III; Uterwijk, 2000) was also obtained as a measure of current intellectual functioning. Furthermore, standard neuropsychological tests were administered, assessing the domains memory (including intrusions) and executive function. **Performances of the groups in**

these tasks was compared. Later, the performances on neuropsychological tests was correlated with confabulation scores. Confabulation behavior is related to impaired performance on a wide range of memory tasks, such as verbal memory tasks, non-verbal memory tasks, effortful recall tasks, and less demanding cued recall tasks (Cunningham, Pliskin, Cassisi, Tsang, & Rao, 1997). To cover a wide range of memory aspects, the memory test battery in this study consisted of the Dutch version of the Rivermead Behavioural Memory Test - Third edition (RBMT-3; Wester, 2014) to assess anterograde everyday memory problems, and the Dutch version of the California Verbal Learning Test (CVLT; Mulder, Dekker, & Dekker, 1996) to assess verbal memory ability. On the CVLT, the number of intrusions was also recorded. The executive function test battery consisted of the Trail Making Test (TMT; Bowie & Harvey, 2006) as a measure of mental flexibility; the Tower of London test (TOL; Shallice, 1982) and the Mazes subtest from the Wechsler Intelligence Scale for Children (WISC; Kort *et al.*, 2005) to assess planning capacity; and the Stroop Color-Word Test (Hammes, 1973) as a measure of response inhibition.

The executive measures described above are chosen as problems with inhibiting incorrect responses and monitoring responses have been proposed to underlie confabulation (Mercer, Wapner, Gardner & Benson, 1977). However, results from more recent studies, often using the TMT and inhibition as measured with the Stroop Color-Word Test, are inconclusive (Cunningham, *et al.*, 1997; Fischer *et al.*, 1995; Schnider *et al.*, 1996). Previous studies lacked more open-ended executive functioning tasks, which might be relevant with respect to the ecological validity. Therefore, we also included TOL and Mazes as open-ended executive functioning tasks, measuring planning ability.

Neuropsychological assessment was performed approximately six weeks after admission of the patients to the Vincent van Gogh Institute, to ensure that the patients were completely abstinent from alcohol. Ethical approval for this study was given by the

Institutional Review Board of the Vincent van Gogh Institute for Psychiatry (CWOP). The participant gave written informed consent before entering the study.

[INSERT TABLE 1 HERE]

Table 1 summarizes the group characteristics. The groups did not differ significantly with respect to age, sex distribution, estimated intelligence, or education. On the executive tests, a significant difference was found only for the Stroop Color-Word Test ( $F(1,36) = 4.22$ ,  $p = .047$ ,  $\eta_p^2 = .11$ ). As expected, the Korsakoff group had significantly lower scores on memory tests than the alcoholic control group (all  $ps < .026$ ).

### *Internal consistency of categories from the alpha version*

INSERT TABLE 2

### *Participants and analyses*

After the scores from the caregivers were obtained, internal consistency, or interrelatedness, of the items per category of the alpha version (spontaneous confabulation, provoked confabulation, memory and orientation, total confabulation score) was examined by calculating Lambda 2 reliability (Guttman, 1945; Ten Berge & Zegers, 1978). Scores, rated by primary responsible caregivers, for the total sample of 52 participants (28 Korsakoff patients and 24 alcoholic controls) were used in the analyses. The ‘scale if item deleted’ option was used, which per item indicates whether deleting that particular item would increase the reliability of the category. We looked at the internal consistency of the category items per patient group, as well as for all participants together (see Table 2). Since the alcoholic control group produced very few spontaneous confabulations (indicating a floor effect), their spontaneous confabulation score could not be used to determine the internal consistency of this particular scale, because of low variance.

## Results

In order for the observation scale to be feasible and quick to administer in clinical practice, our aim was to develop an observation scale with no more than 20 items. We therefore removed two items; One item (*Does the patient always tell the same stories, or does the content change?*) contributed the least to the internal consistency, the other (*Does the patients tell old stories like they happened recently?*) had overlap with another item.

The ‘scale if item deleted’ option revealed that eliminating any of the items from the spontaneous confabulation category in the Korsakoff group produced a lower internal consistency; therefore, no items were deleted.

If item 15 (*‘When the patient is being asked about something (s)he does not remember anymore, does (s)he admit this?’*) would be eliminated, internal consistency of provoked confabulation could increase to respectively: .97 (all participants), .95 (Korsakoff group), and .97 (alcoholic control group). However, this category then would consist of only two items. Since the reliability with 3 items was good already, we retained item 15 (see Table 2).

The beta version of 20 items (after removal of the two items described above) was used for further analyses (see Appendix for beta version). This version had four outcome measures: Spontaneous confabulation (items 1, 2, 3, 4, 5, 7, 10, 16, and 17), provoked confabulation (items 13, 14, and 15), memory and orientation items (items 6, 12, 18, 19, and 20), and a total confabulation score (responses to all 20 items summed up, with item 8, 9, and 11 only contributing to total score). The beta version of the observation scale is referred to as the Nijmegen-Venray Confabulation Scale-20 (NVCL-20).

## Inter-rater reliability

INSERT TABLE 3

*Participants and analyses*

Thirty-three participants of the initial group of 41 participants, also had been assigned a secondary responsible caregiver (next to the primary responsible caregiver). For these 33 participants (19 Korsakoff patients and 14 alcoholic controls), the observation scale was completed by the primary and secondary responsible caregivers (i.e., trained psychiatric nurses). There were 25 individual responsible caregivers, combined into 25 different pairs of primary and secondary responsible caregivers. Inter-rater reliability was measured using intra-class correlation coefficients. The mean rater scores for items assessing spontaneous confabulation, provoked confabulation, memory and orientation, and the total confabulation score were used in the analyses. Interpretation of the intra-class correlation coefficients (ICCs) is based on the guidelines as proposed by Cicchetti and Sparrow (1981).

*Results*

Results from the analyses are presented in Table 3. The ICCs were excellent in all participants and in the Korsakoff group (ICCs ranging from .76 to .80) and good in the alcoholic control group (ICCs ranging from .64 to .73) for spontaneous confabulation, memory and orientation, and the total confabulation score. Good reliability coefficients were found for provoked confabulations within the total group and in the alcoholic control group (ICC = .62). Fair agreement (ICC = .50) was found for provoked confabulation in the Korsakoff group taken in isolation.

**Validation (beta version)***Concurrent Validity**Dalla Barba Confabulation Battery and provoked confabulation test*

Next to the NVCL-20, two other confabulation measures, the Dalla Barba confabulation battery (DBCB) and provoked confabulation test (PCT), were administered to assess concurrent validity. The Dutch version of the DBCB (Dalla Barba, 1993; Peters, Merckelbach, Jelicic, & van Damme, 2012) was used in this study. This is a semi-structured interview that contains 64 questions. Questions are divided into seven different categories: Personal semantic memory, episodic memory, general semantic memory, prospective memory, orientation in time and place, and ‘I don’t know semantic’ and ‘I don’t know episodic’. These latter two categories consist of questions that have been constructed to receive an ‘I don’t know’ response; for example “*Do you remember what you did on March 13, 1985?*”. Instead of giving an ‘I don’t know’ response, confabulating patients often provide an incorrect answer in reply to these questions (Dalla Barba, 1993). In the Dutch version of this test, questions from the English-language version were adjusted to Dutch news facts (Peters *et al.*, 2012). The patients’ answers were later scored by the investigator as correct, incorrect, confabulation, ‘I don’t know’ or not applicable. As in Dalla Barba, Nedjam and Dubois (1999) the total number of correct answers and the total number of intrusions on the DBCB were used for the analyses in this study.

The PCT (Cooper *et al.*, 2006) was also administered. Here, the patient was asked to name five picture cards (e.g., image of a doctor, a bus). Next, he/she was asked to construct a short story based on the five pictures. After a short interval, the patient was asked to freely recall the story they had constructed. This was followed by a recognition task, which consisted of 20 questions about the five pictures. These questions were divided into four categories: very specific questions, specific questions, general questions, and ‘I don’t know’ questions. The correct responses and ‘confabulations’ were scored by the investigator. Again, incorrect responses to ‘I don’t know’ questions represent potential confabulatory responses.

The total number of correct answers and the total number of intrusions on the PCT were used for the analyses in this study.

INSERT TABLE 4

### *Participants and analyses*

The DBCB and PCT were administered in the initial group of 42 participants, however, one of these participants declined from participation. Therefore DBCB and PCT scores of 41 participants were available. Scores on the NVCL-20 categories were available for the total sample of 52 participants. Because of a floor effect found on the NVCL-20 in the alcoholic control group, it was decided to use only the scores of the Korsakoff group in the correlational analyses. Therefore, one tailed Spearman correlations between categories and total score of the NVCL-20 (scores of only the primary responsible caregiver) were conducted with the scores of 28 Korsakoff patients. In 24 Korsakoff patients, the DBCB and PCT were administered in addition to the NVCL-20. Subsequently, to examine concurrent validity, one tailed Spearman correlations between the total score and category scores of the NVCL-20 and the total correct scores and confabulation scores of the DBCB and PCT were conducted with data of these 24 Korsakoff patients

### *Results*

The results from the correlational analyses are presented in Table 4. The total and category scores on the NVCL-20 correlated significantly with one another, ranging from .59 (spontaneous confabulation and memory and orientation) to .92 (total score and spontaneous confabulation). Validating the NVCL-20 total and category scores against the *total scores* of the DBCB and the PCT, showed that participants with higher numbers of correct answers on the DBCB and PCT were less likely to confabulate, according to the NVCL-20. These significant correlations ranged from  $r_s = -.39$  (NVCL-20 provoked confabulation and DBCB



total score) to  $r_s = -.57$  (NVCL-20 total score and PCT total score). **The only relation that failed to be significant was between the NVCL-20 spontaneous confabulation category and the DBCB total score.**

Validating the NVCL-20 total and category scores against the *confabulation* scores of the DBCB and the PCT, showed that Korsakoff patients who confabulated according to the total and category scores of the NVCL-20, also confabulated according to the PCT. These significant correlations ranged from .39 (provoked confabulation) to .51 (total score). The DBCB confabulation score did not significantly correlate with any of the NVCL-20 scores. It must be noted that correlations between the spontaneous and provoked confabulation categories of the NVCL-20 and measures from the other instruments were broadly similar.

The total correct scores of the PCT and DBCB correlated significantly ( $r_s = .47$ ). Participants who obtained higher scores on the DBCB performed better on the PCT. However, the confabulation scores of the DBCB and PCT did not correlate significantly with one another.

### ***Predicted differences based on diagnostic groups***

INSERT TABLE 5

### ***Participants and analyses***

The scores from 52 participants (28 Korsakoff's and 24 alcoholic controls) were used to compare group differences on the NVCL-20. The scores of 41 participants (24 Korsakoff's and 17 alcoholic controls; **only the scores given by the primary responsible caregiver**) were used to compare group differences on the DBCB and PCT. Assumptions regarding normality of distributions were checked. Shapiro-Wilk tests showed that the data for performance on the NVCL-20 were not normally distributed (all  $ps < .001$ ). This can be explained by floor effects,

particularly found in the alcoholic control group. The differences in performances on the NVCL-20 between the two groups were therefore analyzed using Mann-Whitney U tests.

### *Results*

Results are presented in Table 5. It was found that the Korsakoff group had significantly higher total scores ( $U = 91.50$ ,  $p = <.001$ ), spontaneous confabulation scores ( $U = 153.00$ ,  $p = .001$ ), provoked confabulation scores ( $U = 101.50$ ,  $p = <.001$ ), and memory and orientation scores ( $U = 114.50$ ,  $p = <.001$ ) than the alcoholic control group.

When looking at the performance on the DBCB and PCT (also not normally distributed), almost no differences were found between the groups. The only significant difference was found for the ‘I don’t know’-episodic items on the DBCB ( $U = 131.00$ ,  $p = .049$ ), where the alcoholic controls had higher confabulation scores than the Korsakoff patients. We also included delay between admission and administration as a covariate in the above analysis, but found no significant differences.

### ***Relation between time of admission and administration of the NVCL-20***

INSERT TABLE 6

### *Participants and analyses*

We examined whether the frequency of confabulations diminished over time. The NVCL-20 category scores from 28 Korsakoff patients (only the scores given by the primary caregiver) and the time between admission and administration (in weeks) were used for the analysis. There was a mean delay of 25.32 weeks (range: 1 week to 78 weeks) between admission and administration of the NVCL-20. Spearman correlations (two-tailed) were computed between scores and the delay between admission and administration of the scale.

## Results

In the Korsakoff group, negative correlations were found between spontaneous ( $r_s = -.06$ ), provoked confabulations ( $r_s = -.16$ ), and memory and orientation ( $r_s = -.29$ ) and time of administration of the NVCL-20, indicating that prevalence of both types of confabulations slightly decreased when the time between admission and administration of the NVCL-20 increased. However, the correlations were not significant.

### *Confabulation in relation to memory, intrusions and executive function*

INSERT TABLE 7

### *Participants and analyses*

As addressed earlier, a floor effect was found in the alcoholic control group on the NVCL-20. We therefore used only the scores (given by the primary caregiver) of the Korsakoff group ( $n = 28$ ) when correlations were conducted between cognitive measures and the NVCL-20 total score. When correlations were conducted between cognitive scores and the DBCB and PCT, scores from the group of 24 Korsakoff patients, in which the DBCB and PCT were administered, were used in the analyses.

The RBMT-3 and CVLT were used in this study to examine aspects from ‘memory’. Individual test scores of the Korsakoff patients on these tests were converted to standardized Z-scores. For the RBMT-3, the screening score and the total number of corrects answers on all trials of the CVLT were used. Subsequently, a *memory composite score* was made, by calculating the mean of the RBMT-3 and CVLT Z-scores. Z-scores were also calculated for TMT interference score, TOL total score, Mazes total score and Stroop interference, and an *executive function composite score* was determined in the same way as described above. Z-scores were also calculated for the total number of intrusions on all trials of the CVLT. This

score was used as the *intrusion score*. Spearman rank correlations were calculated to relate the confabulation scores of the NVCL-20, DBCB, and PCT to performance on the individual neuropsychological tests, the intrusion score and the memory and executive function composite scores (see Table 6).

## Results

The results from the correlational analyses are presented in Table 7. A significant, negative correlation was found between memory composite score and the total confabulation score on the NVCL-20 ( $r_s = -.50$ ). Participants who obtained higher scores on the memory tests had a lower total confabulation score on the NVCL-20. Significant, negative correlations were also found between the total score of the NVCL-20 and the individual memory tests (RBMT,  $r_s = -.47$ ; CVLT,  $r_s = -.43$ ). No significant correlations were found between the memory scores (composite score or subtest scores) and the confabulation scores of the DBCB and PCT. No significant correlations were found between the intrusion score and the confabulation scores on the NVCL-20, DBCB and PCT. None of the executive tests (composite and individual executive tests) correlated significantly with any of the confabulation measures.

## Discussion

The aim of this study was to develop a reliable and valid observation scale for quantifying confabulatory behavior. We wanted to include spontaneous and provoked confabulations, as well as memory and orientation. Criteria were that the instrument had to be convenient for use in clinical practice; therefore, it had to be brief and easy to administer. On the basis of a literature search, expert opinion, and evaluation of professional caregivers, the NVCL-20 was constructed. It consisted of a third-party observation scale containing 20 items.

The inter-rater reliability was ‘good’ to ‘excellent’ for almost all the categories measured within the NVCL-20. A ‘fair’ inter-rater reliability was found only for provoked confabulations in the Korsakoff group. **This outcome might potentially be influenced by the raters themselves. Outcomes of this particular scale should therefore be interpreted with caution.** These results indicate that the scale should be easy to use, and reliable, in clinical practice. Internal consistency was excellent for spontaneous confabulation, and good-to-excellent for the provoked confabulation, and for memory and orientation. Internal consistency could not be calculated for spontaneous confabulation in the alcoholic control group, due to low variance. Almost no confabulatory behavior was observed in the control group, which is what one would expect to find in this non-Korsakoff group. Internal consistency was excellent for the total confabulation score.

The relation between the NVCL-20 and the DBCB and PCT was investigated to examine whether and how it was related to other instruments that are assumed to measure the same construct. **We found that patients who confabulated according to the NVCL-20 had lower total correct scores on the DBCB and PCT. Moreover, participants who were given high NVCL-20 scores by responsible caregivers, also obtained high scores on the PCT, which supports the concurrent validity of the NVCL-20. However, implications of two further results must be considered. First, both spontaneous and provoked confabulation categories of the NVCL-20 correlated significantly with the PCT confabulation score, hence, suggesting that these categories might not represent distinct processes. Differentiating between these forms of confabulation remains difficult however, since by definition, provoked and spontaneous confabulation are highly correlated constructs. Second, the NVCL-20 and PCT did not correlate with the DBCB confabulation score. This latter finding is noteworthy, as the three instruments aim to quantify the same underlying construct. An explanation might lie in the nature and scoring of the DBCB items. It is difficult to distinguish if participants are**

guessing, rather than actually confabulating. For instance, when asking: “*The minister of foreign affairs from the United States of America had to resign because of what affair?*” a participant answered: “*Monica Lewinsky*” when the correct response should be: “*I don’t know*”. According to the DBCB scoring this is considered a confabulation, however, the participant might also have tried to guess what a possible correct answer might be. This is qualitatively different from confabulation, as the participant is aware of the incorrect nature of their response. As a result, the DBCB confabulation score might reflect a qualitatively different construct than the confabulation scores of the PCT and NVCL-20.

Large, significant differences were found between the Korsakoff group and the alcoholic control group on the NVCL-20 scores for spontaneous and provoked, memory and orientation, and the total confabulation score. The Korsakoff patients showed more spontaneous and provoked confabulations. They also made more memory and orientation errors. Almost none of the patients in the alcoholic control group produced spontaneous confabulations on the NVCL-20. Thus, the NVCL-20 is able to distinguish between Korsakoff patients and alcoholic controls. Some studies have noted that confabulations are more commonly seen early after the onset of the syndrome and improve over time (Kapur & Coughlan, 1980; Schnider, Ptak, von Däniken, & Remonda, 2000). This study did not find that scores regarding spontaneous confabulation, provoked confabulation, and memory and orientation declined over time in patients with Korsakoff’s syndrome.

The literature on confabulation is conflicting with regard to the relation between confabulation behavior and executive functions. Spontaneous confabulation is thought often to result from of (orbito-) frontal or ventro-medial frontal pathology (Kopelman, 2010). However, several studies have not found significant correlations between confabulations (as measured with the PCT and DBCB) and tests considered to be sensitive to executive dysfunction (Cooper *et al.*, 2006; Dalla Barba *et al.*, 1999; Kessels *et al.*, 2008). In this

investigation, also no significant correlations were found between the total confabulation score of the NVCL-20 and performance on neuropsychological tests of executive function. The findings above might be explained by an idea raised by Kopelman, Ng, & Van Den Brouke (1997), who suggested that the tests measuring executive dysfunction included in this study (TMT, TOL, Stroop Test, and Mazes subtest from the WISC) might not reveal the specific frontal dysfunction underlying confabulatory behavior. *Schnider et al. (1996)* suggested that the presence of temporal order recognition failure might set confabulating patients apart from other amnesics. Tests measuring this type of executive dysfunction might therefore relate to confabulation as measured with the NVCL-20. This particular dysfunction might be distinct from the commonly known executive failures that were assessed with the current, standardized, neuropsychological test battery. Moreover, this could explain the absence of a relation between confabulation and executive function in this study. With respect to other neuropsychological tests, we found strong correlations between confabulation behavior, as measured on the NVLC-20, and scores of memory function. These results were found only on the NVCL-20. The total score of the NVCL-20, in accordance with *Kessels et al. (2008)*, did not correlate significantly with the intrusion score. This indicates that, although maybe related, these two phenomena are dissociated. Using intrusions as an index for confabulations may therefore not be justified. The confabulation scores of the DBCB and the PCT did not show significant correlations with any of the composite or individual test scores.

Although these results point towards relations between confabulations and memory, but not between confabulations and intrusions or executive functions, they must be interpreted with caution. The NVCL-20 scores were generally obtained at a later date than the neuropsychological testing. As a result of longer time of abstinence, potential discrepancies may have occurred between patients' cognitive functioning at the time of the

neuropsychological assessment and patients' current cognitive functioning when the NVCL-20 was completed.

A strength of the NVCL-20 is that confabulation scores are obtained through the observations of carers. This makes it possible to obtain a standardized measure for spontaneous confabulation, which is not available to date. Several limitations of our study should also be acknowledged. Since there is no objective measure of spontaneous confabulation, the groups were categorized on the basis of their diagnosis, assuming that patients with Korsakoff's syndrome are more likely to produce confabulations than patients in an alcoholic control group. In this study, we aimed to provide such a measure, so that in the future groups can be selected based on their confabulation behavior. Furthermore, it remains uncertain whether the spontaneous and provoked confabulation categories of the NVCL-20 reflect distinct cognitive categories, rather than a single underlying process. Based on the content of the items, we had expected to distinguish two different phenomena. However, the results for these categories were largely similar throughout this study.

Performing a factor analysis would be helpful in gaining more insight into the validity of the three category structure that we proposed. Depending on how low the communalities are, the number of factors, and the indicators per factor, sample sizes ranging from 100 to 300 would be needed (MacCallum, Widaman, Zhang, & Hong, 1999). With our sample size, execution of a factor analysis for the NVCL-20 was not possible. A large scale study would be required to validate these instruments further. With a larger sample size, it would be also interesting to examine the receiver operating characteristic (ROC) curve to examine sensitivity and specificity, and determine a potential cut-off score for determining confabulation in Korsakoff's syndrome. The significant group differences and the floor effect found in the alcoholic control group found in this study, hint that these populations might be suitable for such an analysis. In the meantime, scores regarding provoked confabulation and



spontaneous confabulation obtained with the NVCL-20 must be carefully interpreted, as they might not reflect different constructs. Also, although results of this study demonstrated good internal consistency and inter-rater agreement, significant group differences on the NVCL-20, positive correlations with the PCT confabulation score and the memory composite score, the interpretation and generalization of the present results need to be considered with caution as a consequence of the small sample size of this study.

The NVCL-20 was completed by the primary (and sometimes also secondary) responsible caregivers, who were aware of the clinical diagnosis of the patients. This prior knowledge might have influenced the scoring, and might possibly explain (some part) of the significant differences found between the Korsakoff group and the control group on the categories of the NVCL-20. To filter out this effect, it would be valuable for future studies to complete the NVCL-20 by a group of observers who are blind for diagnosis.

It would be interesting to administer the NVCL-20 to other patient groups who are known to produce confabulations, for example patients with Alzheimer's disease or patients with ruptured anterior communicating artery (ACoA) aneurysms. Confabulations in these patients groups are often based on observations, or the number of intrusions they make on memory tests are interpreted as confabulations (Kern, Gorb, Cummings, Brown, & Osato, 1992). The validity of these methods is questionable, and the latter method measures only provoked confabulation. Moreover, some studies have found a dissociation between, or no unequivocal relationship with, intrusions on memory tests and provoked confabulation behavior (Kessels *et al.*, 2008). Therefore the NVCL-20 should be a valuable addition to the range of available assessments. The NVCL-20 could also be helpful in quantifying the patterns of spontaneous and provoked confabulation in these other patient groups.

To summarize, the NVCL-20 is capable of distinguishing between patients with Korsakoff's syndrome (confabulating patients) and a non-confabulating alcoholic control

group. The categories of the NVCL-20 have good to excellent internal consistency and inter-rater agreement. Strong correlations with tests measuring executive functions in this study were not found, possibly because the frontal control mechanism linked to confabulations is distinct from the executive tests used. Strong correlations with memory tests were found. We propose to expand this study in a larger sample of patients, including other diagnostic groups, in order to examine further the underlying subscale structure of the scale.

### **Acknowledgements**

The authors thank the professional caregivers and the patients of the Centre of Excellence for Korsakoff and Alcohol-Related Cognitive Disorders of the Vincent van Gogh Institute for Psychiatry, for their contribution. The authors report no conflict of interest.

## References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th edition). Arlington, VA: American Psychiatric Publishing.
- Baddeley, A., & Wilson, B. (1988). Frontal amnesia and the dysexecutive syndrome. *Brain and Cognition*, 7, 212-230.
- Bartlett, F. C. (1932). *Remembering: A study in Experimental and Social Psychology*. Cambridge: Cambridge University Press.
- Bates, M. E., Bowden, S. C., & Barry, D. (2002). Neurocognitive impairment associated with alcohol use disorders: implications for treatment. *Experimental and Clinical Psychopharmacology*, 10, 193-212.
- Bonhoeffer, K. (1901). *Die akuten Geisteskrankheiten des Gewohnheitstrinkers. Eine klinische Studie*. Jena: Gustav Fischer.
- Borsutzky, S., Fujiwara, E., Brand, M., & Markowitsch, H. J. (2008). Confabulations in alcoholic Korsakoff patients. *Neuropsychologia*, 46(13), 3133-3143.
- Bowie, C. R., & Harvey, P. D. (2006). Administration and interpretation of the Trail Making Test. *Nature Protocols* 1, 2277-2281.
- Burgess, P. W., & Shallice, T. (1996). Confabulation and the control of recollection. *Memory*, 4, 359-411.
- Cicchetti, D. V., & Sparrow, S. S. (1981). Developing criteria for establishing interrater reliability of specific items: Applications to assessment of adaptive behaviour. *American Journal of Mental Deficiency*, 86, 127-137.
- Cooper, J. M., Shanks, M. F., & Venneri, A. (2006). Provoked confabulations in Alzheimer's disease. *Neuropsychologia*, 44, 1697-1707.
- Cunningham, J. M., Pliskin, N. H., Cassisi, J. E., Tsang, B., & Rao, S. M. (1997).

- Relationship between confabulation and measures of memory and executive function. *Journal of Clinical and Experimental Neuropsychology*, 19, 867-877.
- Dalla Barba, G. F. (1993). Different patterns of confabulation. *Cortex*, 29, 567-581.
- Dalla Barba, G. F., Nedjam, Z., & Dubois, B. (1999). Confabulation, executive functions, and source memory in Alzheimer's disease. *Cognitive Neuropsychology*, 16, 385-398.
- Dalla Barba, G. F., & Wong, C. (1995). Encoding specificity and intrusion in Alzheimer's disease and amnesia. *Brain and Cognition*, 27, 1-16.
- Fischer, R. S., Alexander, M. P., D'Esposito, M., & Otto, R. (1995). Neuropsychological and neuroanatomical correlates of confabulation. *Journal of Clinical and Experimental Neuropsychology*, 17, 20-28.
- Giancola, P. R. & Moss, H. B. (1998). Executive cognitive functioning in alcohol use Disorders. *Recent Developments in Alcoholism*, 14, 226-251.
- Guttman, L. (1945). A basis for analyzing test-retest reliability. *Psychometrika*, 10, 255-282.
- Hammes, J. (1973). *De Stroop Kleur-Woord Test: Handleiding [The Stroop Color-Word Test: Manual]*. Amsterdam: Swets & Zeitlinger.
- Kern, R. S., Gorp van, W. G., Cummings, J. L., Brown, W. S., & Osato, S. S. (1992). Confabulation in Alzheimer's disease. *Brain and Cognition*, 19, 172-182.
- Kessels, R. P. C., Kortrijk, H. E., Wester, A. J., & Nijs, G. M. (2008). Confabulation behavior and false memories in Korsakoff's syndrome: The role of source memory and executive functioning. *Psychiatry and Clinical Neurosciences*, 62, 220-225.
- Kapur, N., & Coughlan, A. K. (1980). Confabulation and frontal lobe dysfunction. *Journal of Neurology, Neurosurgery, and Psychiatry*, 43, 461-463.
- Kopelman, M. D. (1987). Two types of confabulation. *Journal of Neurology, Neurosurgery and Psychiatry*, 50, 1482-1487.
- Kopelman, M. D. (2002). Disorders of memory. *Brain*, 125, 2152-2190.

- Kopelman, M. D. (2010). Varieties of confabulation and delusion. *Cognitive Neuropsychiatry*, 15, 14-37.
- Kopelman, M. D., Ng, N., & Van Den Brouke, O. (1997). Confabulation extending across episodic, personal, and general semantic memory. *Cognitive Neuropsychology*, 14, 683-712.
- Kort, W., Schittekatte, M., Bosmans, M., Compaan, E. L., Dekker, P. H., Vermeir, G., & Verhaeghe, P. (2005). *Wechsler Intelligence Scale for Children - Third Version*. Amsterdam : Harcourt; NIP
- MacCallum, R. C., Widaman, K. F., Zhang, S., & Hong, S. (1999). Sample size in factor analysis. *Psychological Methods*, 4, 84-99.
- Mercer, B., Wapner, W., Gardner, H., & Benson, D. F. (1977). A study of confabulation. *Archives of Neurology*, 34, 429-433.
- Moscovitch, M., & Melo, B. (1997). Strategic retrieval and the frontal lobes: evidence from confabulation and amnesia. *Neuropsychologia*, 35, 1017-1034.
- Mulder, J. L., Dekker, R., & Dekker, P. H. (1996). *Verbale Leer en Geheugen Test*. Lisse: Swets & Zeitlinger.
- Nahum, L., Bouzerda-Wahlen, A., Guggisberg, A., Ptak, R., & Schnider, A. (2012) Forms of confabulation: dissociations and associations. *Neuropsychologia*, 50, 2524-2534.
- Parsons, O. A., & Farr, S. P. (1981). *The neuropsychology of alcohol and drug abuse*. New York: Wiley.
- Peters, M. J. V., Merckelbach, H., Jelicic, M., & Van Damme, I. (2012). Een Nederlandse versie van de Dalla Barba confabulatie test [A Dutch version of the Dalla Barba Confabulation Test]. *Tijdschrift voor Neuropsychologie*, 7, 49-59.

- Rourke, S. B., & Grant, I. (1999). The interactive effects of age and length of abstinence on the recovery of neuropsychological functioning in chronic male alcoholics: a 2-year follow-up study. *Journal of the International Neuropsychological Society*, 5, 234-246.
- Schacter, D. L., Norman, K. A., & Koutstaal, W. (1998). The cognitive neuroscience of constructive memory. *Annual Review of Psychology*, 49, 289-318.
- Schmand, B., Bakker, D., Saan, R., & Louman, J. (1991). The Dutch Reading Test for Adults: a measure of premorbid intelligence level. *Tijdschrift voor Gerontologie en Geriatrie*, 22, 15-19.
- Shallice, T. (1982). Specific impairments of planning. *Philosophical Transactions of the Royal Society of London*, 298, 199-209.
- Schnider, A. (2001). Spontaneous confabulation, reality monitoring, and the limbic system – a review. *Brain Research Reviews*, 36, 150-160.
- Schnider, A. (2008). *The confabulating mind: how the brain creates reality*. New York: Oxford University Press Inc.
- Schnider, A., & Ptak, R. (1999). Spontaneous confabulators fail to suppress currently irrelevant memory traces. *Nature Neuroscience*, 2, 677-681.
- Schnider, A., Ptak, R., von Däniken, C., & Remonda, L. (2000). Recovery from spontaneous confabulations parallels recovery of temporal confusion in memory. *Neurology*, 55, 74-83.
- Schnider, A., von Däniken, C., & Gutbrod, K. (1996). The mechanisms of spontaneous and provoked confabulations. *Brain*, 119, 1365-1375.
- Tallberg, I. M., & Almkvist, O. (2001). Confabulation and memory in patients with Alzheimer's disease. *Journal of Clinical and Experimental Neuropsychology*, 23, 172-184.

Uterwijk, J. (2000). *WAIS-III Nederlandstalige bewerking. Technische handleiding*. Lisse: Swets & Zeitlinger.

Victor, M., Adams, R. D., & Collins, G. H. (1971). *The Wernicke-Korsakoff syndrome*. Philadelphia: F.A. Davis.

Wester, A. J. (2014). *Assessment of everyday memory in patients with alcohol-related cognitive disorders using the Rivermead Behavioural Memory Test* (Doctoral dissertation, Donders Institute for Brain, Cognition and Behaviour, Centre for Cognition, and Behavioural Science, Radboud University Nijmegen, The Netherlands). Retrieved from <http://repository.ubn.ru.nl/bitstream/handle/2066/126371/126371.pdf>

Zahr, N. M. Kaufman, K. L., & Harper, C. G. (2011). Clinical and pathological features of alcoholic-related brain damage. *Nature Reviews Neurology*, 7, 284-294.

## Appendix

### Instructions

Confabulating is talking about experiences or memories that are incorrect. It is not the same as lying: people who lie deliberately tell stories that are not true, but the patient who confabulates does not deliberately do this. The patient is often convinced of the truth of his/her story. This questionnaire was developed to measure spontaneous confabulations, that is, confabulations that the patient produces without a prompt or in reply to a specific question. Some of the questions do address provoked confabulations (in reaction to a question), but this is then specifically stated. In addition, several questions address the patient's memory and orientation.

Every question has five possible answers. Please encircle the answer that is most appropriate for the behaviour of the patient at the time of completing the instrument. If you feel that none of the options are appropriate, please circle the first option: ① There is space at the end for possible remarks or comments.

How often have you seen the patient or spoken to him/her?

- 1 hardly, less than 5 days of contact with the patient
- 2 not often, more than 5 days but less than 15 days of contact with the patient
- 3 frequently, I have been in contact with the patient several days a week during several weeks
- 4 often, I have been in contact with the patient several days a week during a period of 1 to 3 months
- 5 very frequently, several days a week for a period longer than 3 months

### Items of the NVCL-20

1. Does the patient confabulate spontaneously? Does (s)he spontaneously tell stories that are incorrect with respect to time and/or place?
  - 1 never
  - 2 rarely
  - 3 sometimes
  - 4 often
  - 5 (almost) always
2. How often does the patient spontaneously confabulate?
  - 1 rarely to never
  - 2 a few times a week
  - 3 almost every day
  - 4 several times a day



- 5 this happens almost continuously
3. Is the content of the confabulations realistic? Would someone who does not know the patient believe him/her (does the patient want to go out to work, or does (s)he tell you that (s)he has a meeting with the Queen?)
  - 1 the stories are realistic (if the context is not being taken into account)
  - 2 some elements of the story do not seem to be plausible
  - 3 an outsider would have doubts about the truth of the story (meeting a famous person, being very rich)
  - 4 it is obvious that some elements of the story cannot be true
  - 5 the stories are very hard to believe
4. Does the patient tell you or others that (s)he has an appointment with others (family, doctor) when this is not the case?
  - 1 never
  - 2 rarely
  - 3 sometimes
  - 4 often
  - 5 (almost) always
5. Does the patient tell you or others that (s)he had visitors who in fact never visited him/her?
  - 1 never
  - 2 rarely
  - 3 sometimes
  - 4 often
  - 5 (almost) always
6. Does the patient believe to be somewhere else than where (s)he actually is?
  - 1 never
  - 2 rarely
  - 3 sometimes
  - 4 often
  - 5 (almost) always
7. Are the confabulations coherent stories, or are they difficult to follow and highly associative?
  - 1 the stories are coherent and easy to follow
  - 2 the stories are usually easy to follow, but some details are incorrect
  - 3 the gist of the stories is clear, but details are incorrect and the patient frequently changes the subject
  - 4 the stories are difficult to follow, the patient often changes the subject
  - 5 the patient rambles and tells stories that are difficult to follow, swerves off topic

8. Can the patient be corrected when telling these stories?
- 1 yes, the patient immediately assumes that (s)he is incorrect
  - 2 yes, it only takes a little persuasion to convince the patient that (s)he is mistaken
  - 3 sometimes, the patient occasionally sticks to his/her conviction
  - 4 usually not, only confronting him/her with the incorrectness of a story results in reconsideration (e.g., an outside temperature of 25°C when the patient states that it is winter)
  - 5 no, the patient cannot be convinced of the reality and reacts negatively on efforts to do so
9. Does the patient recognizes acquaintances correctly?
1. yes, always
  2. often
  3. sometimes
  4. rarely
  5. no, never
10. Does the patient show incorrect familiarity ('recognize' strangers, or mistake people for someone else)?
- 1 never
  - 2 rarely
  - 3 sometimes
  - 4 often
  - 5 (almost) always
11. Does the patient see or hear things that are not present?
- 1 never
  - 2 rarely
  - 3 sometimes
  - 4 often
  - 5 (almost) always
12. When the patient is being asked about the reason for admittance, does he/she respond correctly?
- 1 yes, always; the patient responds correctly where he/she is and why
  - 2 often
  - 3 sometimes
  - 4 rarely
  - 5 no never; the patient does not know where (s)he is and why

13. When the patient is being asked what (s)he did yesterday, does (s)he answer correctly?
- 1 yes, always
  - 2 often
  - 3 sometimes
  - 4 rarely
  - 5 no, never
14. When the patient is being asked about plans for the day or the next weekend, does the patient answer correctly?
- 1 yes, always
  - 2 often
  - 3 sometimes
  - 4 rarely
  - 5 no, never
15. When the patient is being asked about something (s)he does not remember anymore, does (s)he admit this?
- 1 yes, always
  - 2 often
  - 3 sometimes
  - 4 rarely
  - 5 no, never
16. Does the patient act upon his/her confabulations? Does (s)he for example walk to the door to wait for somebody or does (s)he get up during a conversation to take care of the dog?
- 1 never
  - 2 rarely
  - 3 sometimes
  - 4 often
  - 5 (almost) always
17. How often does the patient act or want to act upon the confabulations?
- 1 rarely to never
  - 2 a few times a week
  - 3 almost daily
  - 4 several times per day
  - 5 this happens almost continuously

18. Is the patient well oriented to place?

- 1 yes, the patient can correctly name the location and name of the clinic
- 2 fairly, the patient is usually able to correctly tell where (s)he is
- 3 so-so, the patient cannot always correctly provide the location or the clinic's name
- 4 poorly, the patient cannot correctly tell where (s)he is and often thinks he is somewhere else
- 5 very poorly, the patient is convinced to be somewhere else (at home, at work)

19. Is the patient well oriented to time?

- 1 yes, the patient can correctly name the date and day
- 2 fairly, the patient is sometimes one day wrong
- 3 so-so, the patient can tell the month and year correctly
- 4 poorly, the patient can tell which season it is, but not the date or month
- 5 very poorly, the patient cannot name the date and is often several months or years off

20. Is the patient capable of remembering things, such as names of other patients or appointments?

- 1 yes, (s)he can do this without problems
- 2 fairly, it is sometimes necessary to repeat things
- 3 so-so, information must be presented several times
- 4 poorly, only names of patients which whom (s)he is in frequent contact will be remembered
- 5 very poorly, the patient does not seem to profit from repetition and names of other patients are not remembered

<b>TOT</b>	1-20	
<b>SPON</b>	1, 2, 3, 4, 5, 7, 10, 16, 17	
<b>PROV</b>	13, 14, 15	
<b>MEM</b>	6, 12, 18, 19, 20	

Table 1

*Group Characteristics of the Korsakoff group (KS) and alcoholic control group (ALC)*

	KS	ALC	<i>p.</i>
Group Demographics			
Age	55.86 (9.1)	54.29 (8.6)	n.s.
Sex (male/female)	20/8	15/9	n.s.
Education	4 (5)	4 (3)	n.s.
Delay admission- administration (in weeks)	25.32 (77)	17.25 (73)	n.s.
Neuropsychological Testing			
NART-IQ	92.67 (14.02)	94.77 (15.56)	n.s.
WAIS-III FSIQ	82.19 (11.40)	86.30 (11.49)	n.s.
CVLT total correct	43.59 (15.13)	84.22 (26.53)	<.001
CVLT total intrusions	14.78 (10.48)	8.65 (7.73)	.025
RBMT standard profile score	9.83 (5.25)	17.53 (4.56)	<.001
TMT interference	102.24 (81.85)	84.56 (49.86)	n.s.
Stroop interference	142.84 (86.53)	94.88 (46.38)	<.05
TOL total score	24.62 (3.43)	26.14 (3.28)	n.s.
Mazes total score	22.54 (9.82)	26.06 (6.47)	n.s.

*Note.* Average and standard deviations are presented for age, delay between admission and administration and the scores of neuropsychological testing. Median and range are presented for education, frequency scores are given for the variable 'sex'. NART-IQ, National Adult Reading Test-IQ; WAIS-III FSIQ, Wechsler Adult Intelligence Scale-III Full Scale IQ; CVLT, California Verbal Learning Test; RBMT, Rivermead Behavioural Memory Test; TMT, Trail Making Test D-KEFS, TOL, Tower of London.

Table 2

*Internal consistency (Lambda 2) of the categories of the Nijmegen Venray Confabulation List-20 (NVCL-20) for all participants, Korsakoff patients (KS) and alcoholic control group (ALC)*

	All participants	KS	ALC
Spontaneous	.91	.91	xx <sup>a</sup>
Provoked	.83	.75	.91
Memory and Orientation	.90	.91	.81
Total Confabulation Score	.95 <sup>b</sup>	.94 <sup>b</sup>	.96 <sup>b</sup>

<sup>a</sup>. Could not be obtained because of low variance

<sup>b</sup> Results should be interpreted with caution, due to small sample sizes; Total Group  $N = 52$ ; KS group  $n = 28$ , ALC group  $n = 24$ .

Table 3

*Inter-rater reliability (intra-class correlation coefficients) for all participants, Korsakoff patients (KS) and alcoholic control group (ALC) on the Nijmegen Venray Confabulation List-20 (NVCL-20) categories*

NVCL-20 category	All participants	KS	ALC
Spontaneous confabulation	.78	.79	.64
Provoked confabulation	.62	.50	.62
Mem & Orientation	.80	.77	.73
Total Confabulation Score	.79	.76	.68

Table 4.

*One-sided Spearman correlations between categories of the Nijmegen Venray Confabulation List-20 (NVCL-20), and total scores and confabulation scores of the Dalla Barba Confabulation Battery (DBCB), and Provoked Confabulation Test (PCT) in the Korsakoff group*

	NVCL-20 Provoked	NVCL-20 Memory & Orientation	NVCL-20 Total Score	PCT Confabu- lation	PCT Total Correct	DBCB Confabu- lation	DBCB Total Correct
NVCL-20 Spontaneous	.753***	.588***	.921***	.478**	-.519**	.008	-.247
NVCL-20 Provoked		.716***	.894***	.394*	-.528**	.151	-.393*
NVCL-20 Memory & Orientation	-		.791***	.400*	-.531**	.260	-.403*
NVCL-20 Total Score	-	-		.506**	-.569**	.173	-.441*
PCT Confabulation	-	-	-		-.520**	.114	-.096
PCT Total Score	-	-	-	-		-.241	.466*
DBCB Confabulation	-	-	-	-	-		-.331



---

*Note.* There was a mean delay of 5.9 months (range: 1 week to 78 weeks) between cognitive testing and administration of the NVCL-20.

\*  $p < .50$ ; \*\*  $p < .010$ ; \*\*\*  $p < .001$

Table 5

*Means and standard deviations of performances of the Korsakoff group (KS) and alcoholic control group (ALC) on Nijmegen-Venray Confabulation List-20 (NVCL-20), Dalla Barba Confabulation Battery (DBCB), and Provoked Confabulation Test (PCT)*

Confabulation measures	KS	ALC	p-value
NVCL-20			
Total Score	35.73 (13.90)	24.15 (6.53)	<.001
Spontaneous	14.0 (6.4)	10.3 (2.8)	<.001
Provoked	7.5 (2.8)	4.5 (2.2)	<.001
Memory&Orientation	9.3 (4.6)	5.7 (1.5)	<.001
DBCB			
Total correct score	47.9 (4.6)	50.6 (6.0)	n.s.
Total confabulation score	7.8 (3.5)	8.4 (5.2)	n.s.
Autobiographic-semantic	0.1 (0.3)	0.2 (0.7)	n.s.
Autobiographic-episodic	1.0 (1.2)	0.6 (1.0)	n.s.
Semantisch	0.6 (0.9)	0.7 (1.2)	n.s.
Prospective	1.8 (1.4)	1.4 (1.3)	n.s.
Orientation	0.2 (0.4)	0.1 (0.2)	n.s.
'I don't know' episodic	2.3 (1.6)	3.4 (1.7)	<.05

## Rensen-Assessment of Confabulation

	'I don't know' semantic	1.7 (1.4)	2.0 (1.7)	n.s.
PCT				
	Correct answers	16.9 (2.2)	17.4 (1.9)	n.s.
	Provoked confabulations	1.3 (1.0)	1.1 (0.9)	n.s.

---

*Note.* Mean number of confabulations on the different categories of the DBCB are presented

Table 6

*Spearman (two tailed) correlations between admission and administration of the Nijmegen Verbal Confabulation List-20 (NVCL-20) in the Korsakoff's group (KS)*

NVCL-20 categories	<i>r</i>
Spontaneous Confabulation	-.064
Provoked Confabulation	-.158
Memory and Orientation	-.294

Table 7

*Spearman correlations between confabulation scores on confabulation instruments, individual neuropsychological tests, and composite scores of neuropsychological tests in Korsakoff participants*

Neuropsychological Tests	NVCL-20	DBCB	PCT
Memory (composite)	-.503*	-.030	-.329
RBMT-3	-.474*	-.038	-.268
CVLT	-.433*	.062	-.328
Executive Functioning (composite)	-.277	.012	-.298
TMT	-.009	-.065	.018
TOL	-.299	-.063	-.288
Mazes	-.169	-.120	-.132
Stroop task	.155	.340	-.137
Intrusions	.032	.165	.273

*Note.* NVCL-20, total score of the Nijmegen Venray Confabulation List-20; PCT, confabulation score of the Provoked confabulation test; DBCB, confabulation score on the Dalla Barba Confabulation Battery; RBMT-3, screeningscore on the Rivermead Behavioural Memory Test-3; CVLT, total number of correct responses on all trials of the California Verbal Learning Test; TMT, interference score on the Trail Making Test D-KEFS, TOL, total score on the Tower of London; Mazes, total score on the Mazes subtest of the Wechsler Intelligence Scale for Children; Stroop, interference score on the Stroop Color-Word Test; Intrusions, total number of intrusions on all trials of the CVLT.

\*  $p < .50$ ; \*\*  $p < .010$ ; \*\*\*  $p < .001$